DOCUMENT RESUME

ED 477 003 IR 021 731

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TITLE	Developing a Large Web-Based Learning Environment--Can a Style Guide Help Learning Material Developers?
PUB DATE	2002-06-00
NOTE	7p.; In: ED-MEDIA 2002 World Conference on Educational Multimedia, Hypermedia & Telecommunications. Proceedings (14th, Denver, Colorado, June 24-29, 2002); see IR 021 687.
AVAILABLE FROM	Association for the Advancement of Computing in Education (AACE), P.O. Box 3728, Norfolk, VA 23514. Tel: 757-623-7588; e-mail: info@aace.org; Web site: http://www.aace.org/DL/.
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	Computer Assisted Instruction; Computer Interfaces; *Computer Software Development; *Guided Design; Guidelines; *Guides; Higher Education; Hypermedia; Instructional Design; Man Machine Systems; *Material Development; *Multimedia Instruction; *Multimedia Materials

ABSTRACT

An application specific style guide was produced for a large web-based multimedia and hyper-media learning project. It was introduced to 15 different sets of developers at Universities in disparate locations to promote consistency and good HCI practice for the whole project. This paper discusses the reactions to the use and practicality of the style guide through the findings of a survey undertaken one year later. In general, many negative and neutral attitudes towards the style guide were recorded. However, specific trends were observed due to exposure and use of the style guide, the background and experience of the developers and task involvement of developers. The paper discusses the understanding of HCI in the project and the need to encourage developers to use a style guide in multi-media and hypermedia learning projects. (Author)

Developing a Large Web-Based Learning Environment – Can a Style Guide Help Learning Material Developers?

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Abstract: An application specific style guide was produced for a large web-based multi-media and hyper-media learning project. It was introduced to 15 different sets of developers at Universities in disparate locations to promote consistency and good HCI practice for the whole project. This paper discusses the reactions to the use and practicality of the style guide through the findings of a survey undertaken one year later. In general, many negative and neutral attitudes towards the style guide were recorded. However, specific trends were observed due to exposure and use of the style guide, the background and experience of the developers and task involvement of developers. The paper discusses the understanding of HCI in the project and the need to encourage developers to use a style guide in multi-media and hypermedia learning projects.

Introduction

During the development of multi-media and hyper-media based learning material, there are often many Human-Computer Interaction (HCI) issues that arise. Developers therefore need to pay attention to good HCI practice when developing learning material. This is particularly important when an e-learning project is large and involves many developers, since it is often impractical for HCI checks to be made on every piece of learning material produced. One way to help achieve consistency in interface design is the use of a project-wide style guide. The use of a style guide can positively influence projects that are geographically dispersed, even, as in this case, when there is only a small group of Human Factors experts working on the software development project (Colbert, 1997).

Style guides, in one form or another, are used extensively in many industrial projects that use human-machine interfaces. They are also common place in many large web-site developments. However, the use of style guides in e-learning projects has not been widely documented. Universities and colleges often maintain a *corporate* style guide for their externally focused informational web sites, yet there are few examples of Higher Educational organisations using style guides during the design of user interfaces for computer-based learning materials. In places where they are used, it is normally in the form of *look and feel* or *corporate* guides, rather than helping the developer with task specific *application* style guides.

Much of the research in the area of styles guides that has been done to-date has been in commercial and industrial settings. There have been accounts from a number of authors on the benefits and problems of using style guides (Colbert, 1997; Hill, 1995; Kostelnick, 1998; Simpson, 1999; and Washington, 1993). The reported benefits of style guides are often more about the outcomes of applying good HCI practice, rather than empirically studying the implementation of the style guide. Those that have studied the development and use of style guides report that developers benefit from having more specific advice at hand (Simpson, 1999), that guidelines can be distributed quite cheaply and can be practical without the need for a HCI specialist and that user testing may not be necessary in aspects of the interface that are covered by the style guide (Hill, 1995). Accounts of specific problems with the implementation and use of style guides are more easy to pin-point. A re-occurring theme is that of the difficulty in managing the style guide. The process for managing the development, implementation, use and revision of a style guide is not well defined (Simpson, 1999). Washington has also reported that the "requirements analysis" and "promotion" of the style guide are often ignored or overlooked which often has detrimental affects. Hill identifies that guidelines can (1) be difficult to interpret; (2) often give contradictory advice and therefore need to be interpreted in context; and (3) often consider theoretical problems which, in practice, are not experienced often. Similarly, Kosteinick reported that developers can become frustrated deciding which style to adopt, particularly in the event that two or more styles conflict.

Use of a Style Guide in a Large Web-Based Educational Project

The authors of this paper were brought in to advise on the Human-Computer Interaction (HCI) issues of a large web-based educational project. It was decided to introduce a style guide that all learning material developers could use. The team began by performing a "requirements analysis". A review was carried out of all fifteen University partners who were producing chemistry related distance learning material. As was expected, each partner was offering learning material in a format that they had developed independently. Therefore, inconsistencies existed in the whole look and feel of material, in the organisation of the content and in the way interaction between the learner and the information was initiated and completed. More importantly, there was an extensive amount of what could be deemed as "bad practice" being adopted across the University partners. Therefore, paramount was the construction of a style guide that would address the variations and contradictory signals being sent to the learner and to instill "good practice" principles in the developers. The purpose was to produce a style guide that would help application developers at the University partners - so that learners could concentrate upon learning the material, rather than wrestling with the interface.

Style Guide Development

A style guide should advise when and how to use controls and input methods and should encourage consistency and re-use within the aims of the project (Colbert, 1997). Therefore, the goal of our style guide was led by the need to provide clear direction on consistency and good practice during the development of learning material. This required guidance on application specific HCI design elements such as the design of interactive experiments, affordance and system navigation, as well as expected features such as text layout, design of primitive elements and the use of colour. In all, 44 separate elements that affect the interface design for websites were addressed. Particular features of the application style guide included:

- a section of readable prose explained why a style guide was necessary and how ensuring a similar *look and feel* throughout the project would be of help to the learner;
- individual recommendation sections on each of 44 different HCI design elements;
- a pull-out A3 size "pictorial reference" guide sheet at the back of the style guide that provided synopses of guidelines, with references to the main sections in the guide itself;
- full use of laser printed colour copying to offer the best clarity possible;
- softcopy production on CDROM in PDF format for convenience and accessibility.

In each of the 44 individual recommendations sections on design elements, the guide offered background information and a description of features, together with a diagram, and then outlined explicit recommendations or design guidance. The recommendations were tailored specifically towards the project and the use of the design elements for learning materials. Recommendations were provided on what developers should, and should not do with the item and indicated the degree of flexibility in the use of the item in the project. Following these recommendations, a set of examples was provided for each section of the style guide. These examples were screen-dumps of existing practice within the project or associated learning material and were accompanied by notes explaining any good points and possible usability issues.

The style guide was offered with the full backing and consent of the project management, the technical team and the educational content advisory group. It was introduced to the project partners and the learning material developers at a conference. The partners took hardcopy and softcopy guides away with them, in anticipation that they would be used in the further development of the learning material in the project.

Research into the Use of the Style Guide

During the following year, the use and influence of the style guide was noted whenever visits were made to developers. One project partner made full colour copies of the style guide for each member of the project team, which showed a commitment (at least in monetary terms) to the use of the guide. In other partner locations, the hardcopy of the guide was on the shelf of the project leader, apparently unused. Therefore, the authors of the application style guide sought to find out the usage of the guide, its practicality and any recommendations for improvements that could be made. At a conference, one year after the launch of the original guide, feedback forms were handed out to all conference attendees. The form included simple answer, Likert-based rating scales and detailed answer questions, on a two-sided sheet of A4. Responses were collected and collated. The remainder of this paper discusses the results obtained and the implications both for this specific project and also for others seeking to use a style guide in educational multimedia developments.

Investigation into the Effective Use of the Style Guide

Response Rate

The response rate of relevant conference participants was approximately one third (n=18). Of those who responded, 2 people had not had any exposure to the style guide and did not answer any specific rating-scale questions. A further 4 people only answered the first section of rating questions, relating to initial impressions but did not provide responses to their current attitudes towards the style guide. Therefore, only around 65% of respondents (n=12) fully answered all of the questions on the feedback questionnaire. Respondents comprised chemistry teachers (n=3, all completed all questions), other chemists (n=8, only 5 completed all questions) and computer scientists (n=7, only 4 completed all questions).

General Attitudes

One of the main findings from this feedback was that very few developers had truly used or referred to the style guide in the one year period. One third of respondents answered that they had only seen, but never used the style guide. The remaining two thirds had used the guide a few times during the course of the year but only two of these people said that they were currently using the style guide in their work.

Generally, trends were observed in the respondent's use of the style guide and how positive their answers were. However, usage made no difference to the responses for some of the questions. In particular, most respondents provided negative feedback when asked if the guide offered them any new information or improved their knowledge of interface design issues. Feedback from the questionnaires also indicated a lack of understanding about the use of a style guide. Rating scale responses on initial impressions were mixed and included a lot of negative attitudes towards the style guide, even before it had been used. Free text answers from respondents suggested that they believed the style guide to be just something of interest, rather than to be actively used in day to day development of learning material. Many believed that the technical management group should sift through the recommendations and then present a standard set of icons and buttons and controls and should force all developers to do *exactly* the same thing with their material every time. Feedback also showed that they did not consider the style guide useful when it offered choice. In general, developers did not want general comments and ideas, they said that they wanted to be told what to do in each circumstance. They assumed that this would be the only way to provide the learner with a feeling of seamless interchange between the learning material in different modules, that had been developed by different partners in the consortium.

Respondents were asked about their attitudes towards each presentation idea used in the style guide. They were asked to rate the usefulness of the *look and feel* section, the detailed recommendations, the good and poor usability examples and the A3 pictorial reference guide. A nearly equal mix of positive, negative and neutral responses were recorded for every presentation idea except the use of examples, which had five times as many positive responses as negative ones. Free text answers also offered support for the use of good and poor usability examples and indicated that developers found these a good foundation for internal discussions, so that mistakes were not repeated in future. However, there was sense of egocentricity in responses. The project involved sixteen different partner groups developing learning material for a single learning environment, yet most respondents only wanted to see views on their part of the development. Respondents did not want to see examples of errors that others had made, indicating that the believed they would not learn from others mistakes.

Trends in Negative and Positive Attitudes Towards the Style Guide

Importantly, the exposure and use of the style guide appeared to be related to the attitudes offered in the responses to the rating scales. The most negative responses were from the one third of people who had not actually used the style guide. Most of those who had not used the style guide provided few responses to questions. Where there were responses from non-users, they were either negative opinions or indifferent attitudes. This was in contrast to those who had used the guide, who offered many positive responses. Also, the most positive responses came from the person who was currently using it in their day to day work.

Results showed some trends in attitudes for those with similar backgrounds. In particular, chemistry teachers offered the most negative responses. All chemistry teachers provided negative reactions to the use of the style guide in helping the development of learning materials, solutions to problems during development and the production of multi-media elements. They also said that it did not improve their knowledge of interface design or help improve the learning material that they were developing. In contrast, the computer scientists offered much more favourable responses. They were positive about the guide being clear, initially helpful and

still helpful one year on. They indicated that it was helpful in finding solutions to interface problems, helping develop learning materials generally, and was specifically helpful in the development of multi-media elements.

Responses were also considered in terms of the tasks that people performed and the computer packages they used during development. Trends in attitudes towards the helpfulness of the style guide were observed for these task groups. Figure 1 summarises each group's attitude towards the 6 questions that were asked involving the helpfulness of the style guide during development.

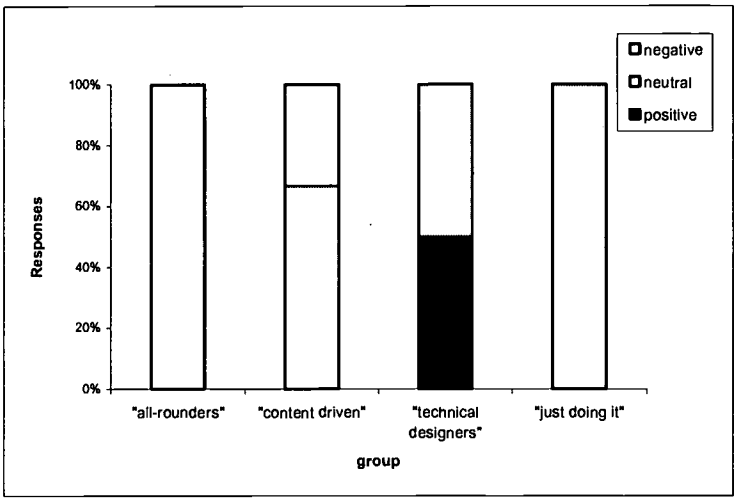

Figure 1: the attitudes of different task groups in response to 6 questions on the helpfulness of the style guide in design and development.

The first distinct task group were the "all-rounders" (n=6) who had very high involvement in the development of content and the design and who also used a number of packages including editors (HTML or other Web enabling package), graphics and animation or video packages. These were all chemists or chemistry teachers, with a mix of qualification levels. No particular pattern was observed in their exposure or use of the guide with some never having used it, some using it a few times during the year and one currently using it. This task group offered different opinions on their general attitudes about the clarity, usefulness and whether they were happy using the guide. However, they all provided similar, negative, attitudes towards the guide in terms of helpfulness in finding solutions to problems and developing learning material. The negative responses in figure 1 relate only to attitudes about the helpfulness of the style guide for design, development and review of resources.

The second task group were those who were "content driven" (n=4). These people were involved in the development of text, graphics and some animation or video work, but did not use as many packages as the "all-rounders". They were all chemists and one was a teacher as well as a chemist. As seen in figure 1, the views of this group were less extreme, although generally not positive. This group also did not think that the style guide offered them any new information and did not improve their knowledge of interface design issues.

The third task group identified were the "technical designers" (n=3). These had no influence over the development of the content and therefore concentrated upon the design of text, graphics, animations and video using a number of appropriate computer packages. Again, there was a mix of exposure and use of the style guide in this group. Interestingly, this group provided mostly positive attitudes towards the style guide. They believed that the style guide was helpful in developing learning material and multimedia elements and helped them find solutions to interface design problems.

The fourth task group could be defined as "just doing" their job (n=3). Two of these group were computer scientists, the other was a chemist, all had lower level qualifications. They were not involved in the development of the content and were limited to the production of text and graphics. The only computer package used was an editor. This group offered more neutral responses than anything else – they were neither positive nor negative in their attitudes towards the usefulness, helpfulness and ease of use of the style guide.

Discussion

The negative and neutral attitudes recorded in the feedback questionnaire, together with a high non-response rate indicate that this group of learning material developers had many problems with the style guide. The lack of exposure and use of the style guide emerged as one possible reason for the unenthusiastic reaction. Indeed, initial impressions (before the guide had been used) were often not positive. Therefore, as a consequence of the original disapproving attitudes together with the style guide not being employed by the developers, the opinions one year on were understandably negative. The following discussion suggests three possible reasons why this situation occurred in this project. These are (1) the lack of understanding of HCI by the developers; (2) the workload and background of developers; and (3) the way that the style guide was managed in the project.

The Understanding of HCI in the Project

Responses to the free text questions in the feedback questionnaire gave the impression that there was a lack of understanding on how to use a style guide, and of HCI in general. Very few developers had come across a style guide before, which was reflected in their search for exact standards, rather than wanting a set of recommendations that they could apply in the right circumstances. Since a style guide should not de-skill the designers but should allow them to spend more time meeting their main objective of supporting user tasks (Browne, 1994) our guide was designed to offer some freedom to designers, whilst ensuring that they did not infringe any standard rules of good HCI practice. However, the developers on this project did not appear to understand this and often felt that there was too much information available. The comprehensive nature of our style guide may have, therefore, been an error, as producing unnecessarily complex style guides caused problems for developers in the past (Colbert, 1997). Yet, the production of detailed methodological guidance and compliance rules for a development environment for complex learning material is not easy. Therefore, providing more information, rather than less, and allowing designers the freedom to choose should still be considered, before offering a smaller sub-set of guidelines.

There was also a general attitude that most HCI information offered the developers nothing new. Most believed that they would not learn anything from the information contained in the style guide and that it was all "common sense". Many thought that past experience as a teacher and personal "feelings" about the design would ensure that learning material would be correct for all learners. These attitudes reflect very little change in developers from those reported by other authors in the past towards acceptance of style guides (Lowgren and Lauren, 1993; Tetzlaff and Schwartz, 1990). These findings are particularly discouraging, since the style guide was introduced at a conference of the developers and also included a section explaining why consistency in the project and the use of a style guide was necessary. Perhaps the case for consistency to help convince the reader of the value of the style guide document (Browne, 1994) has not been presented fully enough in this project. In contrast, a particularly encouraging finding was the apparent relationship between exposure to the style guide and the positive feedback received, generally. Therefore, the conviction exists that if only developers could be encouraged to actually use the style guide, they would find it a more helpful document.

Workload and Background of Developers

The most positive responses came from those who only had a technical involvement with the project. These people were not involved in the production of the actual learning material *content*, but developed animations, graphics and text to support it. Therefore, task orientation may be a reason for the findings. It is possible that "technical designers" are happier using a style guide because they have a better understanding of the use of it, or have previous practice and education in using such materials. Also, they understood the computer packages used and had a better working knowledge of such applications, so they have more time to spend thinking about the design of the material. We recorded a number of feedback answers that implied that "all-rounders" and "content-driven" people felt that they had no time to look at the guide - taking a step back and learning about HCI design principles and their application was not a high priority for them. The design of the material was frequently viewed as one of the easiest parts of the project by teachers and, as such, developing the content took up most of their time and effort. Many "all-rounders" had to learn how to use the package as well as develop the content to the learning material, so time pressures may have meant that they ignored the style guide. Our results have shown a trend that indicates negative views of the style guide are held by those with many things to do in the development of multi-media and hyper-media educational resources, whereas those who have specific design problems have more positive attitudes towards the guide. This implies that more assistance is required to help every developer get the most out of a style guide.

Style Guide Management

The style guide was produced in hardcopy and in softcopy. However, there was little regular use of the style guide in any form. Unfortunately, each partner University was issued with only one hardcopy of the guide. In some cases there were up to 15 different developers working on the project at each partner University and visibility of the style guide was certainly less than we expected. In one partner University copies were produced for every developer but these were very expensive (136 pages, full colour). In most cases only the one hardcopy existed and this, more often than not, resided in one place with the team leader. PDF file format softcopies were not copied to everyone, or used as often as expected, even though the project was being produced on the computer network. We were not aware of these issues until our one year feedback questionnaire was collected and analysed. We expect different results if there were copies on every developers desk. Therefore, it is recommended that a follow-up on the use of the style guide and how well the information is being disseminated to *all* developers is examined in e-learning projects.

There is also one particular latent issue in the management of the entire project that seems to have had an adverse affect upon the use of the style guide. During the year, the technical management group implemented a cascading style sheet (CSS) to provide consistency in the colour, font size and style of the text in web (HTML) pages. The use of the CSS was simply to ensure that standard text was not formatted differently between different project partners. However, the partners saw the development and application of this style sheet as the answer to all of their interface consistency and re-use problems. It did, of course, help the layout of text but could not affect anything within graphics, animations or other applets placed outside of the standard HTML code. One year on, the pages look similar, but there are just as many HCI mistakes taking place in areas that are not formatted HTML text. The implications of the use of a CSS system for web design is that those who are not well informed on HCI issues may have their perceptions on the meaning of "look and feel" and "interface consistency" changed detrimentally.

Conclusions

The style guide produced specifically for this e-learning project was not well used by developers. Exposure to the style guide did prove to be a positive experience for those developers who tried to use it. However, many developers did not use the guide because their prior understanding of HCI issues, the use of a style guide and the meaning of "look and feel" did not encourage them. The background, workload and familiarity with the use of computer packages also affected their attitudes towards the potential helpfulness of the style guide. We have learned that in order to succeed, the implementation of a style guide needs to be closely managed and factors that affect the exposure and use of the style guide by the developers considered.

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